

Gulyayev, B.B.

25(1), 10(5)

FRANK I. BOKE REPLICATION

807/2859

Author's work 802. Earliest metallurgy

Справочник по дефектам в сварке металлов (Hot Cracks in Welds, Jagata, and Castings) Moscow, Izd-vo AN SSSR, 1979. 165 p. 2,700 copies printed.

Ed.: B. B. Gulyayev, Corresponding Member, USSR Academy of Sciences; Ed. of Publishing House: V. S. Trushnikov; Tech. Ed.: Yu. V. Ryklov.

Foreword: This book is intended for metallurgists and welding engineers.

Contents: This is a collection of scientific papers dealing with the formation of hot cracks in jagata, castings, and welded products. Some papers are concerned mainly with the nature or mechanism of the phenomenon; others examine the effect of factors such as technological procedure. Sufficient evidence is presented to identify some of the causes of hot cracks. Various means of investigating and preventing the phenomenon are described. A number of references, both Soviet and non-Soviet, accompany the papers. For further information

39

formation of hot cracks in steel castings. As a criterion for the quantitative determination of the resistance of steel to the formation of hot cracks, the author states that the most important factor is the shrinkage of a standard test specimen with rigidly fastened ends. For mild carbon steel and low-alloy (Cr, Ni, V) structural steel, pouring temperature is one of the most important factors in crack development. Filling the mold with steel at the temperature of the liquidus or below should be avoided. A direct relationship between crack resistance and linear shrinkage, fluidity, and gas liberation was established. Increasing the fluidity of the molten metal by changing the composition or the conditions helps to increase the crack resistance of steel. Hydrogen, and methane decrease the crack resistance of steel. In addition of hydrogen, sulphur, and vanadium to carbon steel or low-alloy steel increases the crack resistance. The maximum hot crack resistance should be held at a minimum so as to ensure a ratio of  $\Delta\epsilon/\Delta\sigma \leq 13$ .

51

Gulyayev, B. B., L. I. Lopyrev, and L. M. Portnov. Formation of Hot Cracks in Steel Castings. The author recommends the following measures for controlling hot cracks in steel castings: 1) decreasing the size of the casting and eliminating projections by casting in several pieces with subsequent welding of the components; 2) equalization of the cooling rates of various parts of the casting and elimination of conjugate parts through a rational determination of the thickness of their elements; 3) increasing fluidity; 4) reduction of the shrinkage of the casting; 5) increasing the fluidity of the molten metal; 6) increasing the fluidity of the molten metal through the use of more plastic welding media and by fitting the mold; 7) regulating the metal composition, insofar as possible, and the pouring conditions so as to reduce the probability of crack development. Consistent application of these measures, the author states, will effectively prevent hot cracks from development. Consistent application of these measures, the author states, will effectively prevent hot cracks from developing.

65

Belokobyl, I. I. Hot (Crystallization) Cracks in the Hard Facing of High-Speed Steel. The author discusses the nature and mechanism of hot-crack formation and examines various factors contributing to it (chemical composition of added metal, cooling rate, etc.).

Belokobyl, I. I. Hot Cracks in the Welding of Chromo-Nickel Austenitic Steels

98

SKOBNIKOV, Konstantin Mikhaylovich; GULYAYEV, B.B., prof., doktor tekhn.  
nauk, retsenzent; LIPNITSKIY, A.M., inzh., red.; LEYKINA, T.L.,  
red.izd-va; SPERANSKAYA, O.V., tekhn.red.

[Potentialities in foundry practice] Rezervy liteinogo proizvodstva.  
Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry, 1959. 199 p.  
(MIRA 13:3)

(Founding)

(Foundries--Equipment and supplies)

S/137/60/000/009/023/029

A006/A001

Translation from: Referativnyy zhurnal, Metallurgiya, 1960, No. 9, p. 261,  
# 21628

AUTHORS: Gulyayev, B.B., Shapranov, I.A., Magnitskiy, C.N., Nevzerova, Z.D.

TITLE: The Effect of Rare-Earth Elements in Crystallization and Mechanical Properties of Cast Steel

PERIODICAL: V sb.: Redkozemel'n, elementy v stalyakh : splavakh, Moscow, Metallurgizdat, 1959, pp. 93-117

TEXT: The authors studied the effect of rare-earth elements introduced to the steel in the form of misch metal in an amount of 0.01 - 1.0%, on the S content; macrostructure and mechanical properties ( $\sigma_b, \sigma_s, \delta, \alpha_k$ ) of commercial Fe and steel with 0.04 - 0.40% C, alloyed with various admixtures (including Cu, Ni, Cr, Si, Mo, Ti, Nb) and also of steels of the following grades: 20Л (20Л), У12 (У12), 40ХЛ (40ХЛ), 30ХН3М (30ХН3М), 1Х18Н9 (1Х18Н9), Х24Н20 (Х24Н20). It was established that treatment with misch metal without changing the properties of non-alloyed Fe, increases the plasticity and ductility of alloyed Fe and steel.

Card 1/2

S/137/EC/000,009/023/029  
A006/A001

The Effect of Rare-Earth Elements on Crystallization and Mechanical Properties of Cast Steel

Addition of 0.2 - 0.5% misch metal to 30KhN3ML<sup>18</sup> steel raises plasticity and ductility of cast steel almost to the level of forged steel. Properties of forged steel, however, are scarcely affected by the introduction of misch metal.

T.F.

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2



18(5,7)

SOV/128-59-8-14/29

AUTHOR:

Gulyayev, B.B., Doctor of Technical Sciences

TITLE:

Estimation of Runner Systems

PERIODICAL:

Liteynoye proizvodstvo, 1959, Nr 8, pp 27 - 31 (USSR)

ABSTRACT:

For an estimation of runner systems usually the formula

$$\frac{G}{T} = F \cdot V_{\pi_3}$$

is used, where (G = weight, T = duration of filling, V = speed of outflow). Using the known hydraulic formulas we can get the middle speed of the outflow of metals. The formula

$$V_{\pi_3} = \mu \sqrt{2g} \sqrt{H}$$

can be used when the metal will be brought to the runner system from above. The formula changes as follows

$$V_{\pi_3} = \mu \sqrt{2g} \frac{(H - h)}{2(\sqrt{H} - \sqrt{h})}$$

Card 1/3

when the metal will be brought by a syphon from be-

SOV/128-59-8-14/29

# Estimation of Runner Systems

low. Finally, when the metal is brought to the middle of the cast mold the formula is

$$V_p = \mu \sqrt{2g} \frac{(H - h) \sqrt{H}}{\sqrt{H} (\sqrt{H} - \sqrt{h}) + \frac{1}{2} (H + h)}$$

(V = speed of outflow in cm/sec, H = hydrostatic pressure in cm, h = difference in cm from the level of metal in the runner cup and the upper level of the mold,  $\mu$  = coefficient of expense depending on local resistance

$\mu = \frac{1}{\sqrt{1 + \sum \tau_i^2}}$ ). The time of filling out the whole system ( $\tau_3$ ) can be found from the empirical formula

$$\tau_3 = A \delta^m G^n$$

Where A, m, n,  $\tau_3$  coefficients (Table 1), G = weight of the cast in kg,  $\tau_3$  = time of filling in sec. The author's theoretic formula for

Card 2/3

SOV/128-59-8-14/29

Estimation of Runner Systems

$$\tau_3 = \frac{1}{k} \times \sqrt[4]{\frac{G}{k^2 \cdot 0,25 \sqrt{t} - \frac{4}{3k \sqrt{0,25 \sqrt{t}}} + \frac{1}{2}}}$$

is similar to the empirical formulas of other authors (Table 1) and was confirmed by experiments and statistics. The final formula for the estimation of the runner system of the mold form can be found by a combination of the formulas (1), (11), (16), and (20) -

$$F_A = (2 \div 3) G^{5/12} = (2 \div 3) \sqrt[5]{\frac{G}{\sqrt{G}}}$$

where  $F_A$  = section area of the mold,  $G$  = weight in kg, the lower part of coefficient of the proportion 2 belongs to the thickwall castings and the upper part 3 to the thinwall castings. There are 9 graphs, 3 tables and 8 Soviet references.

Card 3/3

18 (7)

AUTHORS:

Bakumenko, S. P., Gulyayev, B. B.

SOV/32-25-5-36/56

TITLE:

New Method for the Production of Prints of the Macrostructure  
(Novyy sposob polucheniya otpechatkov makrostruktury)

PERIODICAL:

Zavodskaya Laboratoriya, 1959, Vol 25, Nr 5, pp 617- 618 (USSR)

ABSTRACT:

A new method for the production of prints of the macrostructure without distortions is suggested. A printing color is applied to the templet, and the print is then applied to the paper (Fig 1). The print may be made with the hands or a machine. In the case of larger dimensions the latter process is more favorable as machine-made prints are qualitatively better. The taking of prints from polished and not cut templets leads to a deterioration of quality (Fig 2). For the purpose of taking prints of larger dimensions (700 x 920 mm) a platen machine of the type DSP turned out to be most favorable. There are 2 figures.

ASSOCIATION:

Izhevskiy metallurgicheskiy zavod ( Izhevsk Metallurgical Plant)

Card 1/1

GULYAYEV, S. B.

PHASE I BOOK EXPLOITATION

SOV/5304

Soveshchaniye po teorii liteynykh protsessov. 5th, 1959

Tochnost' otlivok; trudy soveshchaniya (Accuracy of Castings; Transactions of the Fifth Conference on the Theory of Founding Processes) Moscow, Mashgiz, 1960. 206 p. 3,500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut mashinovedeniya. Komissiya po tekhnologii mashinostroyeniya.

Ed. (Title page): B. B. Gulyayev, Doctor of Technical Sciences, Professor; Ed. of Publishing House: G. N. Soboleva; Tech. Ed.: A. F. Uvarova; Managing Ed. for Literature on Hot-Processed Metals: S. Ya. Golovin, Engineer.

PURPOSE: This book is intended for scientific and technical personnel at scientific research institutes, factories, and schools of higher education.

COVERAGE: The book contains 19 reports read at a conference on the accuracy of castings. The conference was organized by the

Card 1/7

Accuracy of Castings (Cont.)

SOV/5304

Committee on Processing in Machine Building and sponsored by the Institut mashinovedeniya AN SSSR (Institute of the Science of Machines of the Academy of Sciences USSR). The reports, presented by leading specialists, science workers, and production personnel, discuss the present state of the problem of the accuracy of castings and methods of solving the problems involved. There are 58 references, mostly Soviet.

TABLE OF CONTENTS:

Foreword	3
SECTION I. GENERAL PROBLEMS OF THE ACCURACY OF CASTINGS	6
Gulyayev, B. B. [Doctor of Technical Sciences, Professor]. Present State of the Accuracy of Castings	6
Aksenov, P. N. [Doctor of Technical Sciences, Professor]. Objectives of Investigating the Accuracy of Castings, Depending on Factors of Processing	19

Card 2/7

Accuracy of Castings (Cont.)	SOV/5304
Komarov, L. Ye. [Engineer]. Distortion of Sand Molds	117
Zhukovskiy, S. S. [Engineer], and Yü Ts'uan-chin [Engineer]. Dimensional Errors of Castings Caused by Patterns and Flasks	125
Dubrovskiy, A. M. [Engineer]. Effect of Thermal Distortion of the Molding Mixtures on the Accuracy of Castings The work of investigating the distortions and thermal stress in the molding mixtures was carried out under the supervis- ion of P. P. Berg.	131
Fomchenko, S. I. [Engineer], and B. B. Gulyayev. Production of Precision Castings in Shell Molds Pressed From a Waterglass Mixture	146
Kolchin, I. F. [Engineer], and V. V. Ryzhenkov [Engineer]. Production of Large Precision Steel Castings by Using Chemi- cally Hardening Mixtures	153

Card 57

Accuracy of Castings (Cont.)

SOV/5304

SECTION IV. ACCURACY IN PRODUCING CASTINGS BY SPECIAL METHODS

Rubtsov, N. N. [Doctor of Technical Sciences, Professor], and I. L. Zelikov [Engineer]. Dimensional Accuracy of Investment Castings

160

Goryunov, I. I. [Candidate of Technical Sciences]. Dimensional Accuracy and Surface Roughness of Castings Obtained by Various Methods

180

O. A. Kantor, A. Ye. Danilov, A. I. Belyayev, and Engineer V. B. Shul'man participated in making castings.

Makel'skiy, M. F. [Engineer], and B. B. Gulyayev. Formation of the Contours of Castings in Die Casting

193

Kolesnichenko, A. G. [Engineer]. Accuracy of Castings Obtained in Metal Molds

203

Card 6/7

Gulyayev, T.P.

PHASE I BOOK EXPLOITATION

SOV/4343

Soveshchaniye po teorii liteynykh protsessov, 3d

Usadochnyye protsessy v metallakh; trudy soveshchaniya (Shrinkage Processes in Metals; Transactions of the Third Conference on the Theory of Casting Processes) Moscow, AN SSSR, 1960. 281 p. Errata slip inserted. 3,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut mashinovedeniya. Komissiya po tekhnologii mashinostroyeniya.

Resp. Ed.: B.B. Gulyayev, Doctor of Technical Sciences, Professor; Ed. of Publishing House: V.S. Rzhernikov; Tech. Ed.: T.V. Polyakova.

PURPOSE: This collection of articles is intended for scientific workers, engineers, technicians of scientific research institutes and industrial plants, and for faculty members of schools of higher education.

COVERAGE: The collection contains technical papers presented at the Third Conference on the Theory of Casting Processes, organized by Liteynaya sektsiya Komissii po tekhnologii mashinostroyeniya Instituta mashinovedeniya AN SSSR (Casting Section of the Commission for Machine-Building Technology of the Institute of Science of Machines, Academy of Sciences USSR) and by Institut metallurgii imeni Baykova  
Card 1/6

Shrinkage Processes (Cont.)

SOV/4343

AN SSSR (Institute of Metallurgy imeni A.A. Baykov, Academy of Sciences USSR). The most serious defects in castings, ingots, and welds as a result of metal shrinkage are reviewed. Factors contributing to the formation of shrinkage cavities, porosity, cracks, fissures, distortion, and internal stresses are analyzed along with measures taken to prevent and remedy them. The hydrodynamics of molten metals and the process of solidification of metals are discussed. Also presented are resolutions adopted at the Conference with regard to the problem of shrinkage in metals. No personalities are mentioned. Most papers are accompanied by bibliographic references, the majority of which are Soviet.

TABLE OF CONTENTS:

Foreword 3

Gulyayev, B.B. The Problem of Shrinkage Processes in Metals 5

I. SHRINKAGE CAVITIES

Magnitskiy, O.N., and B.B. Gulyayev. Influence of Solidification Conditions on the Formation of Shrinkage Cavities in Steel Castings 19  
Card 2/6

Shrinkage Processes (Cont.)

SOV/4343

Veynik, A.I. On the Theory of the Shrinkage Cavity	32
Korol'kov, A.M. Shrinkage Processes in Alloys as Related to Their Phase Diagrams	41
Khafuz, I.M. Casting Properties of Heat-Resistant Alloys	50
Klochnev, N.I., and G.S. Strizhov. Experimental Investigation of Shrinkage Phenomena in Iron Castings With Spheroidal Graphite	57
Smitsyn, K.N. Molten Metal and Alloy Shrinkage and Its Determination	65

II. SHRINKAGE POROSITY

Postnov, L.M., and B.B. Gulyayev. Axial Shrinkage Porosity in Walls of Steel Castings	74
Vlasov, V.I., and Ye.F. Komolova. Investigation of Shrinkage Porosity in Steel Castings	85
Belousov, N.N., and A.A. Dodonov. Investigation of the Effect of Pressure on the Development of Defects in Nonferrous Alloy Castings	97

Card 3/6

Shrinkage Processes (Cont.)

SOV/4343

Altman, M.B. On the Increase in the Density of Aluminum Alloy Castings 112

Sharov, M.V., and Ye.L. Bibikov. Porosity in Castings of Alloys of the Manganese-Alumina-Zinc System 121

III. CRACKS IN CASTINGS AND WELDED JOINTS

Trubitsyn, N.A. Effect of Some Metallurgical and Manufacturing Factors on the Formation of Hot Cracks in Steel Castings 133

Guglin, N.N. On Hot Cracks in Castings 141

Bogeroditskiy, A.L., and V.V. Blinov. Study of Causes of Subsurface Fissure Formation in High-Alloy Steel Ingots 147

Rutes, V.S. Shrinkage Phenomena in Continuous Steel Ingots 152

Skvortsov, A.A. The Connection Between the Cooling Regime of a Continuous Ingot and the Formation of Cracks and Fissures 163

Card 4/6

Shrinkage Processes (Cont.)

SOV/4343

Prokhorov, N.N. Strength of Metals in Welding	174
Medovar, B.I., and Yu.V. Latash. Formation of Hot Cracks and Modern Methods of Preventing Them in Steel Welds With Stable Austenite Structure	187
Lashko-Avakyan, S.V., and N.F. Lashko. Shrinkage Phenomena and the Problem of Weldability of Aluminum Alloys	198
Movchan, B.A. Some Special Features of Solidification and High-Temperature Intercrystalline Fracture of the 1Kh18N9 Steel Welds	206
Prumlin, I.I. Distortion of the Welding Puddle During Crystallization and the Mechanism of Crack Formation	211
Toropov, V.A. The Nature of Hot Cracks in Welds	217
Rabkin, D.M. Prevention of Cracks During Welding of the AMts Aluminum Alloy	222

Card 5/ 6

Shrinkage Processes (Cont.)

SOV/4343

IV. DEFORMATION AND RESIDUAL STRESSES

Goryunov, I.I. Linear Shrinkage of High-Alloy Steel	228
Yegorenkov, I.P. Deviation in the Magnitude of Shrinkage in Castings and Their Manufacturing Accuracy Tolerances	236
Kotsyubinskiy, O.Yu. Calculation of Heat-Conduction Properties of a Mold for Reducing the Residual Stresses in Castings	245
Loktionova, N.A. On Residual Stresses in Aluminum-Alloy Ingots	253
Talypov, G.B. Approximate Theory of Welding Strains and Stresses	264
Resolutions of the Conference	279

AVAILABLE: Library of Congress (TS230.S7)

Card 6/6

VK/wrc/sfm  
11-16-60

PHASE I BOOK EXPLOITATION

SOV/4344

Soveshchaniye po teorii liteynykh protsessov, 4th

Kristallizatsiya metallov; trudy soveshchaniya (Crystallization of Metals; Transactions of the Fourth Conference on the Theory of Casting Processes) Moscow, izd-vo AN SSSR, 1960. 325 p. 3,200 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut mashinovedeniya. Komissiya po tekhnologii mashinostroyeniya.

Resp. Ed.: B. B. Gulyayev, Doctor of Technical Sciences, Professor; Ed. of Publishing House: V. S. Rzhiznikov; Tech. Ed.: S. G. Tikhomirova.

PURPOSE: This book is intended for metallurgists and scientific workers. It may also be useful to technical personnel at foundries.

COVERAGE: The book contains the transactions of the Fourth Conference (1958) on the Theory of Casting Processes. [The previous 3 conferences dealt with hydrodynamics of molten metals (1955), solidification of metals (1956), and shrinkage processes in castings (1957)]. General problems in the crystallization of metals, including the crystallization of constructional steels,

Card 1/8

Crystallization of Metals (Cont.)

SOV/4344

alloy steels with special properties, cast iron, and of nonferrous alloys, are discussed. Recognition is given to D. K. Chernov and N. T. Gudtsov and their students, B. B. Gulyayev and A. G. Spasskiy, for their contributions to the understanding of the basic problems involved in the theory of crystallization of ferrous and nonferrous metals and alloys. Academician A. V. Shubnikov is also mentioned in connection with his work on the planning of research on crystal formation. References accompany several of the articles.

TABLE OF CONTENTS:

Foreword	3
Gulyayev, B. B. Crystallization of Metals	5
I. GENERAL PROBLEMS IN THE CRYSTALLIZATION OF METALS	
Lyubov, B. Ya. Calculation of the Rate of Crystallization of Metal in Large Volumes	35
Mirkin, I. L. Crystallization of Complex Alloys	43
Card 2/8	

Crystallization of Metals (Cont.)

80V/4344

- Magnitskiy, O. N., A. A. Demidova, and B. B. Gulyayev. Influence of Alloy Composition on Conditions of the Primary Crystallization of Castings 49
- Kamenetskaya, D. S., E. P. Rakhmanova, and Ye. Z. Spektor. Investigation of the Crystallization of Iron and Its Alloys 57
- Girshovich, N. G. On the Interrelation Between Solidification and Crystallization Processes 62
- Salli, I. V. Crystallization of Binary Alloys Subjected to Deep Supercooling 69
- Ovsiyenko, D. Ye. Influence of Insoluble Admixtures on the Crystallization and Structure of Metals 76
- Neymark, V. Ye. Influence of the Modifying Agent on the Distortion of Crust and Rate of Crystallization of an Ingot 86

Card 3/8

Crystallization of Metals (Cont.)

SOV/4344

Yuferov, A. M. On the Mechanism of the Crystallization and Recrystallization Processes

94

II. CRYSTALLIZATION OF CONSTRUCTIONAL STEEL

Lapitskiy, V. I., V. N. Luzgin, A. I. Marinov, G. N. Oyks, V. V. Oleksenko, V. I. Orlov, K. P. Rudichev, and N. I. Stupar'. Some Ways of Lowering the Heterogeneity of Large Ingots of Rimmed Steel

100

Khvorinov, N. I. Structure Formation of Steel

108

Novitskiy, V. K., A. V. Mikul'chik, and V. V. Blinov. Investigation of Ingots With Internal Chills

112

Neverova-Skobeleva, N. P. Dependence of the Dendritic Structure and Properties of Cast Steel on the Microstructure

121

Guglin, N. N., A. A. Novikova, and B. B. Gulyayev. Investigation of the Mechanical Properties of Steel at Temperatures Close to the Crystallization Point

126

Card 4/8

Crystallization of Metals (Cont.)

SOV/4344

- Pronov, A. P. Crystallization of a Continuous Ingot and the Influence of Hot-Steel Properties on It 134
- Ivantsov, G. P., and B. T. Polyak. Cooling Regime Securing Minimal Thermal Stresses in the Crust of a Flat Ingot in Continuous Casting 139
- In'shakov, N. N. Influence of the Characteristic Features of Crystallization on the Mechanical Properties of Low-Alloy Cast Steel 150

III. CRYSTALLIZATION OF SPECIAL-PROPERTY  
STEELS AND ALLOYS

- Goryunov, I. I. Influence of Modification on the Structure and Physical-Mechanical Properties of High-Alloy Steels 158
- Aksenov, F. V., N. F. Lashko, and Ye. Ya. Rodina. Structure Formation During Solidification of Turbine Blades Made by Investment Casting 166

Card 5/8

Crystallization of Metals (Cont.)

SOV/4344

Silin, L. L., and A. A. Yerokhin. Effect of Ultrasonic Vibrations on Metal Being Crystallized in a Welding Puddle 176

IV. CRYSTALLIZATION OF CAST IRON

Bunin, K. P., and Yu. N. Taran. Eutectic Crystallization of Gray Iron 180

Chikel', I. Graphite Crystallization in Iron-Carbide Alloys 192

Malinotchka, Ya. N. Intracrystalline Liquation of Silicon in Cast Irons and Steels 209

Zhukov, A. A. Silicon Liquation in Iron-Carbon-Silicon Alloys and the Structure of Cast Iron 220

Lev, I. Ye. Influence of the Cooling Rate During Crystallization on the Distribution of Alloying Elements Between Phases in White Cast Irons 231

Mil'man, B. S. Investigation of the Spheroidal Graphite Formation Process in Cast Iron ( in the Cast State) 237

Card 6/8

Crystallization of Metals (Cont.)

SOV/4344

Shapranov, I. A., and E. V. Petrova. Crystallization of Magnesium  
Cast Iron [with 13 to 18% mg] 251

Kurtov, I. F. On the Modification of Malleable Cast Iron With  
Bismuth and Boron 262

V. CRYSTALLIZATION OF NONFERROUS ALLOYS

Sirota, N. N., Ye. A. Lekhtblau, and E. M. Smolyarenko. Crystallization  
of Alloys in an Ultrasonic Field 268

Spasskiy, A. G. Factors Influencing the Structure of a Casting 272

Belousov, N. N., and A. A. Dodonov. Crystallization of Nonferrous-  
Alloy Castings Under Pressure 279

Varich, N. I., and N. N. Belousov. Influence of Pressure During  
Crystallization on the Change in Submicrostructure of Al<sub>2</sub> and Al<sub>8</sub> Alloys 298

Card 7/8

Crystallization of Metals (Cont.)

SOV/4344

Simonenko, M. V., N. N. Belousov, and V. S. Kolesnikova. Characteristic Features of the Crystallization and Structure of Copper Alloys Obtained by the Electroplating-Diffusion Method [Copper Electroplating Followed by Diffusion Alloying in Special Media at Elevated Temperatures] 303

Movchan, B. A. Characteristic Features of Microscopic Chemical Heterogeneity in Alloys 314

Resolutions of the Conference on the Problem of the Crystallization of Metals 321

AVAILABLE: Library of Congress (TS230.S7)

Card 8/8

VK/pw/ral  
10-19-60

Gulyayev, R.D.

PHASE I BOOK EXPLOITATION

SOV/4199

Leningrad. Politekhnikheskiy institut

Sovremennyye dostizheniya liteynogo proizvodstva; trudy mezhvuzovskoy nauchno-tekhnicheskoy konferentsii (Recent Achievements in Founding: Transactions of the Scientific and Technical Conference of Schools of Higher Education) Moscow, Mashgiz, 1960. 336 p. Errata slip inserted. 4,000 copies printed.

Resp. Ed.: Yu. A. Nekhendzi, Doctor of Technical Sciences, Professor; Eds.: N. G. Girshovich, Doctor of Technical Sciences, Professor, and K. P. Lebedev, Docent; Managing Ed. for Literature on Heavy Machine Building (Leningrad Department, Mashgiz): Ye. P. Naumov, Engineer; Tech. Eds.: Ye. A. Dlugokanskaya, and L. V. Shchetinina.

**PURPOSE:** This book is intended for the technical personnel of foundries. It may be used by students of the field.

**COVERAGE:** This collection of articles discusses problems in founding processes. Individual articles treat the melting  
Card 1/9

Recent Achievements in Founding (Cont.)

SOV/4199

of metals and their alloys, mechanization and automation of casting processes, aspects of the manufacture of steel, cast iron, and nonferrous metal castings. No personalities are mentioned. References accompany individual articles.

TABLE OF CONTENTS:

Foreword	3
I. GENERAL PROBLEMS IN THE THEORY OF FOUNGING	
1. Nekhendzi, Yu. A. Recent Achievements in Founding	5
2. Gulyayev, B. B., and L. I. Kovaleva. Supercooling of Metals	13
3. Kamenetskaya, D. S. Application of the Crystallization Theory to the Study of Solidifying Castings	21
4. Magnitskiy, O. N., and B. B. Gulyayev. Investigation of the Region of Solidification in Castings	25

Card 2/9

Recent Achievements in Founding (Cont.)		SOV/4199
5.	Pikunov, M. V. Behavior of Suspended Admixtures During Crystallization	32
6.	Rabinovich, Ye. Z. Mechanism of Molten Metal Flow	35
7.	Khafuz, I. M. Casting Properties and the Selection of the Method of Pouring the ZhS Type (Oxide) Film-Forming Alloys	41
8.	Rabinovich, B. V. Hydraulics in Gating Systems	46
9.	Postnov, L. M. Theory of Shrinkage Porosity	61

## II. MECHANIZATION AND AUTOMATION IN FOUNDING

10.	Shestopal, V. M. New Methods in Planning Casting Shops and Plants	77
11.	Yegorenkov, I. P. Development of the Manufacture of Founding Machinery	91

Card 3/9

Recent Achievements in Founding (Cont.)

SOV/4199

12. Aksenov, P. N. Scientific Research Work of the Department of Founding Machinery and Methods of the Moscow Automechanical Institute 99
13. Kremer, M. A. Achievements in Casting Practice in a Fittings and Accessories Plant 105
14. Mysovskiy, V. S. Full Automation of the Centralized Mixture Preparation in Casting Shops 114
15. Poruchikov, Yu. P. Automation of Some Processes in Founding 123

III. MELTING OF METALS

16. Matveyenko, I. S. Cupola Melting Process With Oxygen Injection Into the Central Part of the Furnace 128
17. Barinov, N. A. Basic Trends in the Development of the Cupola Process in Metallurgy 140

Card 4/9

Recent Achievements in Founding (Cont.)		SOV/4199
18.	Mariyenbakh, L. M. Investigation of New Types of Fuel for Cupolas	148
19.	Goftman, M. V., and P. Ya. Nefedov. New Methods of Producing Cupola Coke	154
20.	Goncharov, I. N. Utilization of the Steel and Cast Iron Chips in the Industry	159
21.	Gruzin, V. G. Temperature Regime of the Pouring (at Casting) of Hydroturbine Blades	165
22.	Bilyk, V. Ya. Laboratory Methods of Measuring the Temperature of Molten Metals	169

#### IV. PROBLEMS OF MOLD MAKING

23.	Berg, P. P. Dimensional Accuracy of Castings	178
24.	Obolentsev, F. D. Generation of Adhesion Forces Between the Nonmetallic Layer (Pick-Up) and the Casting	183

Card 5/9

Recent Achievements in Founding (Cont.)		SOV/4199
25.	Komarov, L. Ye. Experimental Investigation of the Mold Ramming Process	191
26.	Noskov, B. A. Materials for Shell Molds	201
27.	Abramson, I. D. Ceramic Cores for Investment Casting of Heat-Resistant Alloy Hollow Products of Complex Configuration	205
28.	Mikheyev, N. P. Temperature Regime in Production of Shell Molds and Their Strength	212

V. STEEL CASTINGS

29.	Madyanov, A. M. Mechanism of the Formation of Out-of-Center Ligation in a Steel Ingot	219
30.	Oknov, S. M. Basic Patterns of Crystallization of High-Alloy Corrosion-Resistant Steels With a Lower Content of Nickel	222

Card 6/9

Recent Achievements in Founding (Cont.)

SOV/4199

31. Trubitsyn, N. A. Investigation of Some Factors Affecting the Formation of Hot Cracks in Steel Castings 228
32. Gruznykh, I. V., and Yu. A. Nekhendzi. Acid Resistant Cast Steels 235
33. Gruznykh, I. V. Effect of Processing Factors on the Formation of Hot Cracks in Steel Castings 242
34. Goncharov, G. A. Heating of Risers of Steel Castings 247
35. Yermolayeva, N. P. Some Problems of Creep in Austenitic Cast Steels 252

VI. IRON CASTINGS

36. Landa, A. F. Some Problems of Improving the Quality of Cast Iron 259
  37. Shapranov, I. A., and E. V. Petrova. Specific Features of Solidification of Magnesium-Modified Cast Iron 265
- Card 7/9

Recent Achievements in Founding (Cont.)

SOV/4199

38. Klochnev, N. I. Achievements in the Field of Production of High Strength Cast Iron With Spheroidal Graphite 273
39. Ryabukhev, S. I. Improvement of Magnesium-Modified Cast Iron Production Methods 281
40. Bauman, B. V. Effect of Nitrogen on the Structure and Mechanical Properties of Gray Cast Iron 285
41. Khudokoznov, D. N. Investigation of Graphitizing the Magnesium Modified High-Silicon Malleable Cast Iron 292
42. Giranovich, N. G., and A. Ya. Ioffe. Phosphide Eutetic, Characteristic Features of Its Structure, and Its Effect on Cast Iron Properties 299

VII. NONFERROUS METAL CASTINGS

43. Chursin, V. M. Problems of Grain Refining of Some Copper Alloys 309

Card 8/9

Recent Achievements in Founding (Cont.)

SOV/4199

- 44. Korotkov, V. G. Degassing of Aluminum Alloys by a Direct Current 314
- 45. Dubitskiy, G. M. Design of Gating Systems for Nonferrous Alloy Castings 321
- 46. Butalov, L. V., Yu. A. Nekhendzi, and Yu. A. Filin. Titanium and Its Alloy Shaped Castings 326
- 47. Lunev, A. A. Utilization of Solid Carbonic Acid in Making Nonferrous Metal Castings 332

AVAILABLE: Library of Congress

VK/dwm/ec  
9-12-60

Card 9/9

PHASE I BOOK EXPLOITATION

SOV/4450

Gulyayev, Boris Borisovich

Liteynyye protsessy (Casting Processes) Moscow, Mashgiz, 1960. 415 p. Errata slip inserted. 7,000 copies printed.

Reviewer: P.P. Berg, Professor, Doctor of Technical Sciences; Ed.: A.A. Prozhogin; Managing Ed. for Literature on Machine-Building Technology (Leningrad Department, Mashgiz): Ye. P. Naumov, Engineer; Ed. of Publishing House: M.A. Chfas; Tech. Eds.: A.I. Kontorovich, and O.V. Speranskaya.

PURPOSE: This book is intended for foundry process engineers and the scientific and technical personnel in research institutes and plants. It may be used by teachers, aspirants, and advanced students in schools of higher education.

COVERAGE: The book presents a systematic review of casting processes of molding, metal pouring, and solidification. Recommendations for planning casting processes are made on the basis of former studies. The author thanks Candidates of Technical Sciences I.A. Shapranov, O.N. Magnitskiy, L.M. Postnov, Yu. F. Borovskiy, O.V. Kolacheva; Doctor of Technical Sciences, Professor P.P. Berg; and Scientific

Card 1/6

Casting Processes

SOV/4450

Editor A.A. Prozhogin. There are 437 references: 412 Soviet, 9 English, 9 German, 2 French, 2 Polish, 1 Czech, and 2 unidentified.

TABLE OF CONTENTS:

Foreword	3
Ch. I. Origin and Development of Foundry Technology and the Theory of Casting Processes	5
Ch. II. Classification of Castings and Production Methods	19
1. Classification of castings	19
2. Production methods of castings	21
Ch. III. Structure and Properties of a Nonheated Molding Mixture	29
1. Structure of molding mixtures	29
2. Ramming of molding mixtures	34
3. Mechanical properties of nonheated molding mixtures	41
Ch. IV. Mold Filling	48
1. Properties of molten metals	48

Card 2/6

S/030/60/000/05/45/056  
B015/B008

AUTHOR: Gulyayev, B. R., Doctor of Technical Sciences

TITLE: Problems of the Theory of Foundry Processes <sup>18</sup>

PERIODICAL: Vestnik Akademii nauk SSSR, 1960, No. 5, pp. 112 - 113

TEXT: The 6th Conference on the Theory of Foundry Processes was held from February 24 to 27, 1960, and dealt with the theory of molding. The Conference was convened by the komissiya po tekhnologii masinstroyeniya (Commission of the Technology of Machine Building) of the Institut mashinovedeniya Akademii nauk SSSR (Institute of Engineering of the Academy of Sciences USSR). Academician V. I. Dikushin stated in his opening address that the theory of molding, the central process in foundry production is logging behind as compared with developments in other foundry processes. The generalization of the results of scientific research and of the experience of leading plants in the field of molding-sand mixtures, and the production of molds were the scope of the Conference with a view to favoring the mechanization and automation of the foundry departments. The Conference was attended by collaborators of various institutes of


Card 1/2

Problems of the Theory of Foundry  
Processes

S/030/60/000/05/45/056  
B015/B008

the Academies of Sciences of the USSR, the Academies of Sciences of the Union Republics, the scientific branch research institutes, as well as by delegates from the industry and universities. Investigations of bentonites resulted in the development of the theoretical and technological bases for the manufacture of synthetic molding-sand mixtures, and in the elaboration of new technological processes. A number of reports dealt with the investigation of processes of solidification of the molding-sand mixtures. The Conference underlined in its decisions the insufficient attention which has so far been given to the development of the molding theory, and outlined the trends for the predominant activities in this field. The next Conference is to deal with the problem of the function of the foundry mold.

Card 2/2



GULYAYEV, B.B., POSTNOV, L.M., BOROVSKIY, Yu.F.

Scabs on steel castings. Lit. proizv. no.6:25-29 Je '60.  
(MIRA 13:8)

(Steel castings)  
(Foundries--Quality control)

0123/8.1000/106/0.6/120  
A100/4104

AUTHOR: Guliyayev, B. E.

TITLE: The problem of shrinkage processes in metals

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 6, 1961, 2, abstract  
6G11 (V sb. "Usadochn. protsessy v metallakh", Moscow, AN SSSR,  
1960, 5-18)

TEXT: The author analyzes the results of the principal works of Soviet and foreign investigators devoted to shrinkage cavities, shrinkage porosity, cracks, internal stresses and deformations in castings. He investigates problems of the theory of shrinkage processes, methods of their investigation and measures to prevent shrinkage defects.

Yu. Stepanov

[Abstractor's note: Complete translation]

Card 1/1

S/123/61/000/003/014/023  
A004/A104

AUTHORS: Magnitskiy, O. N., and Gulyayev, B. B.

TITLE: The effect of solidification conditions on the formation of shrinkage cavities in steel castings

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 3, 1961, 21, abstract 3G177 (V sb. "Usadochn. protsessy v metallakh". Moscow, AN SSSR, 1960, 19-31)

TEXT: The authors have investigated the solidification conditions and the nature of shrinkage cavity formation in castings of stearine and palmitic acid alloys, alloys of the Al-Si and Al-Zn systems, iron-carbon alloys and 35Л (35L) steel. By adding radioactive isotopes and by X-raying the basic regularities of the kinetics of shrinkage defect formation were found, depending on the solidification conditions and chemical composition of the castings, and the processes of the formation of shrinkage cavities in foundry heads were investigated. A dimensional foundry head-to-casting ratio is recommended. The investigation of the formation of shrinkage defects in X-, T- and L-shaped wall unions of various thickness by the method of pouring off the liquid residue made it possible to

Card 1/2

S/123/61/000/003/014/023  
A004/A104



The effect of solidification conditions ...

find calculation dependencies to determine the diameter of internal and external coolers. There are 12 figures and 4 references.

Yu. Stepanov

[Abstractor's note: Complete translation]

Card 2/2

S/123/61/000/003/016/023  
A004/A104

AUTHORS: Postnov, L. M., and Gulyayev, B. B.

TITLE: Axial shrinkage porosity in the walls of steel castings

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 3, 1961, 21, abstract  
30179. (V sb. "Usadochn. protsessy v metallakh". Moscow, AN SSSR,  
1960, 74-84)

TEXT: The authors give a brief description of the kinds of porosity depending on the formation conditions: dispersed, axial and local porosity. The process of formation of axial shrinkage porosity is investigated, which is the main cause of a decrease in mechanical properties of the metal in the casting walls. When the limit of metal consumption through the wall cross section becomes less than the consumption determined by the shrinkage conditions, the continuity of the flow is changed by local metal displacements. The advent of this moment determines the general density of the casting. A mathematical analysis of the phenomena based on the thermal laws of solidification and filtration theory, confirmed by a great number of experiments whose results have been worked out by methods of mathematical statistics, make it possible to obtain

Card 1/2

Axial shrinkage porosity in the walls of steel ...

S/123/61/000/003/016/023  
A004/A104

simple calculation dependencies to determine the magnitude of overlapping on the flat walls of castings to increase their density. The utilization of curved overlaps makes it possible to reduce their weight without decreasing the casting density. There are 6 figures and 2 references.

Yu. Stepanov

[Abstractor's note: Complete translation]

Card 2/2

GULYAYEV, B.B.(Leningrad); PRONOV, A.P.(Leningrad); TEMYAYEVA, Z.S.  
(Leningrad).

Academician Nikolai Timofeevich Gudtsov (1885-1957) Izv.  
AN SSSR. Otd. tekhn. nauk. Met.i Topl. no.5:3-12 S-0 '60.  
(MIRA 13:11)

(Gudtsov, Nikolai Timofeevich, 1885-1957)  
(Bibliography--Physical metallurgy)

S/128/60/000/012/009/014  
A054/A030

AUTHORS: Gulyayev, B.B.; Makel'skiy, M.F.; Nazarenko, V.O.

TITLE: Crystallization of Steel Under Pressure

PERIODICAL: Liteynoye proizvodstvo, 1960, No. 12, pp. 33 - 34

TEXT: The problem of improving the quality of a casting by influencing the crystallization process mechanically by means of vibration or pressure has not yet been fully cleared up. When applying vibration (Ref.: N.G. Kasumzade, "Change in Structure and Properties of Steel Under the Influence of Physical-Chemical Factors") during the crystallization process of carbon steels, with a frequency of 1,300 min and an amplitude of 1 mm, the plasticity, the tenacity and, to some extent, also the strength of the steel increased, but only when vibration took place under the above mentioned conditions. Deviations from the given regime reduces the effect of vibration and, in some cases, even causes a deterioration of the metal's properties. According to N.G. Kasumzade's report referred to above, when a uniform pressure not exceeding 80 atm is applied on carbon steel during crystallization, the shrinkage holes become deformed, the density and the tenacity of the metal are increased. In the present article the influence of a

Card 1/6

S/128/60/000/012/009/014  
A054/A030

# Crystallization of Steel Under Pressure

relatively high pressure on the crystallization process of steel castings will be discussed. The experiments were carried out with cylindrical specimens having an upper diameter of 70, a lower diameter of 80 mm and an initial height of 300 mm. The sample was poured in a steel die, whose wall thickness was 100 mm. 2,000, 4,000 and 6,000 kg/cm<sup>2</sup> pressures were applied by a hydraulic press. The time from the beginning of pouring till the application of full pressure was 20 sec, during this time a skin, 13 - 15 mm thick, was formed. The entire interval of hardening did not last longer than 2 min. The pressure period lasted 3 - 4 min. In the tests 20Л (20L), 35Л (35L) and 1Х18Н9Т (1Kh18N9T) type steels were used (pouring temperature 1,580 - 1,600°C, the molds were preheated to 150 - 200°C). The samples were cut from the inner and external parts of the castings. At a pressure of 2,000 kg/cm<sup>2</sup> the shrinkage holes disappeared but the porosity in the axial area remained. The increase in pressure up to 6,000 kg/cm<sup>2</sup> had similar effects. The structure of the various types of steel castings crystallizing under pressure was, in general, the same. The microstructure of 35L and 1Kh18N9TL types crystallizing with (4,000 kg/cm<sup>2</sup>) and without pressure is given in Figure 1. The microstructure of 20L and 35L type steels, both in the superficial (a) and in the axial (b) zones did not change much under pressure. In steel 1Kh18N9TL the effect of pressure was more striking: at a distance of 12 - 15 mm from the

Card 2/6

Crystallization of Steel Under Pressure

S/128/60/000/012/009/014  
A054/A030

surface and parallel with the form surface strips appeared, most probably, indicating displacements taking place the moment pressure was applied. Moreover, under the influence of pressure, new phases separated in the 1Kh18N9TL steel, forming a lattice. In castings crystallizing without pressure, the separation of this phase is inconsiderable. Pressures between 2,000 and 4,000 kg/cm<sup>2</sup> during crystallization cause a slight increase in surface density and also in the intermittent zones, as well as a considerable increase in density in the axial zone of the casting. Pressure of more than 6,000 kg/cm<sup>2</sup> has a negative effect on density. In steel 1Kh18N9T the decrease in density can already be observed at a pressure of 4,000 kg/cm<sup>2</sup>. Pressures of about 2,000 kg/cm<sup>2</sup> during crystallization have mainly this effect that the differences in density in the entire volume of casting are equalized. At higher pressures the attitude of the casting is that of an integer unit. Up till now the cause of the decrease in density at pressures above 4,000 cm<sup>2</sup> has not been established. The changes in the mechanical properties of steel in the external and internal zones are plotted in Figure 2, in function of the piston pressure during crystallization. These data clearly show that during crystallization without pressure the strength limit decreases to some extent from the surface in the direction of the axis, whereas, when crystallizing under pressures of 2,000 - 4,000 kg/cm<sup>2</sup>, the strength limit displays the same values in the

Card 3/6

Crystallization of Steel Under Pressure

S/128/60/000/012/009/014  
A054/A030

entire section of the casting. The absolute values of the strength limit, however, do not change considerably under the effect of pressure. In castings 20L and 35L pressure of 2,000 - 4,000 kg/cm<sup>2</sup> increase the plasticity, mainly in the inner zones. At a pressure of 2,000 kg/cm<sup>2</sup> plasticity is distributed uniformly in the entire section of the casting. In the 1Kh18N9TL steel castings the increase in pressure causes a systematic decrease in plasticity. In this type of steel the entire section displays the same plasticity whether or not pressure is applied. Notch impact strength is not affected to any great extent in carbon steels. In 1Kh18N9TL steel castings notch impact strength decreases with increasing pressure more quickly on the surface than in the inner zones. Evidently, the increase in plasticity under pressure in carbon steel castings is caused by the disappearance of porosity, mainly in the inner zone. The decrease in plasticity and toughness under pressure during crystallization in austenite steel castings (1Kh18N9TL) is connected with the separation of a new brittle phase at the edge of the cores. Under the effect of piston pressure up to 2,000 kg/cm<sup>2</sup> during crystallization shrinkage holes disappear, the distribution of porosity is reduced to a minimum and plasticity increases (when feeding is not delayed). When, however, pressure contributes to the separation of new brittle components, the increase in pressure decreases the plasticity and the tenacity of the metal. There are 2 figures and 2 tables.

Card 4/6

Crystallization of Steel Under Pressure

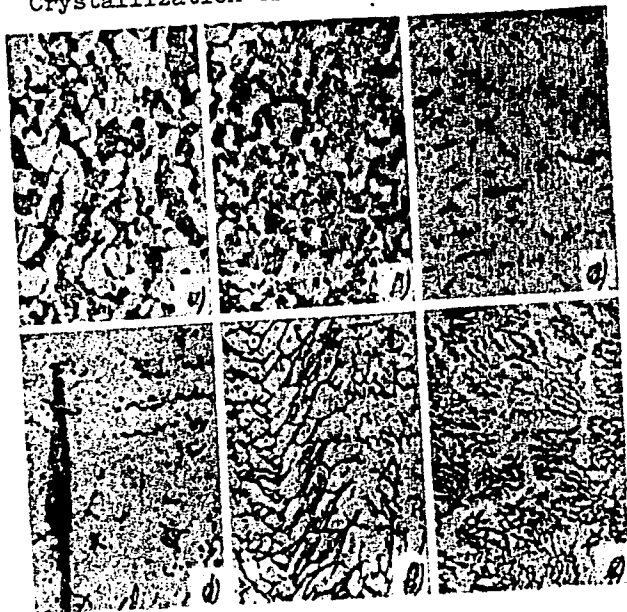


Figure 1: Microstructure of steel 35L.  
a) surface zone; b) axial zone under  
pressure, microstructure of steel  
1Kh18N9TL; c) surface; d) axial zone;  
e and f) surface and axial zones under  
pressure.

Card 5/6

S/128/60/000/012/009/014  
A054/A030

# Crystallization of Steel Under Pressure

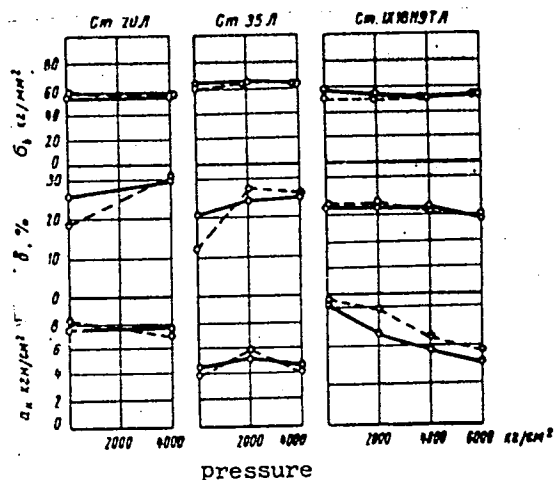


Figure 2: curves of the change of mechanical properties in the external and inner zones of castings in function of the piston pressure during crystallization [Cm = St (steel)]

Card 6/6

"Problems Pertaining to the Fracture of a Casting..."

report presented at the 5th Conference on the Interaction of the Casting Mold and the Casting, sponsored by the Inst. of Mechanical Engineering, Acad. Sci. USSR, 21-25 January 1971.

CHEN, M. S. P. and CHEN, M. S. P.

"An Investigation of the Processes of Interaction between the Inductor  
and the System of Secondary Cooling and the Melt in Continuous Casting"

report presented at the 7th Conference on the Interaction of the Casting Mould  
and the Casting, sponsored by the Inst. of Mechanical Engineering, Acad. Sci.  
USSR, 26-28 January 1981.

G. I. N. N., N. N. N., and L. N. N.

"An Investigation of the Interaction Between the Metal and the  
Mould in the casting of Steel into Ingots"

report presented at the 7th Conference on the Interaction of the Casting Mould  
and the Casting, sponsored by the Inst. of Mechanical Engineering, Acad. Sci.  
USSR, 25-28 January 1961.

CHIRAKOV, I. N. and LITVIN, A. A.

"An Investigation of the processes of interaction of liquid metal resisting  
refractory chemically active metals with the mold"

report presented at the 7th Conference on the Interaction of the Casting Mold  
and the Casting, sponsored by the Inst. of Mechanical Engineering, Acad. Sci.  
USSR, 25-28 January 1961.

OBOLENTSEV, Fedor Dmitriyevich; GULYAYEV, B.B., doktor tekhn. nauk,  
prof., retsenzent; SOKOLOV, A.N., kand. tekhn. nauk, dots., red.;  
VARKOVETSKAYA, A.I., red. izd-va; BARDINA, A.A., tekhn. red.

[Quality of cast surfaces] Kachestvo litykh poverkhnostei. Moskva,  
Gos. nauchno-tekhn. izd-vo mashinostroit. lit-ry, 1961. 181 p.  
(MIRA 14:9)

(Surfaces (Technology))

(Founding)

GULYAYEV, B.B., doktor tekhn. nauk, prof.; SIDORENKO, A.T., red. izd-va;  
ASTAF'YEVA, G.A., tekhn. red.

[Theory of molding; transactions] Teoriia formovki; trudy. Mo-  
skva, Izd-vo Akad. nauk SSSR, 1961. 198 p. (MIRA 14:11)

1. Soveshchaniye po teorii lityynykh protsessov. 6th.  
(Molding (Founding))

RYZHIKOV, Anton Abramovich; GULYAYEV, B.B., doktor tekhn. nauk, retsenzent;  
DUGINA, N.A., tekhn. red.

[Theoretical basis of founding] Teoreticheskie osnovy liteinogo proizvodstva. Izd.2., ispr. i dop. Moskva, Mashgiz, 1961. 446 p.

(MIRA 14:11)

(Founding)

GULYAYEV, B.B.; OBLENTSEV, F.D.

Participants of the International Foundrymen's Conference visit  
French foundries. Lit. proizv. no.3:40-41 Mr '61. (MIRA 14:6)  
(France--Foundries)

S/030/61/000/004/015/015  
B105/B206

AUTHOR: Gulyayev, B. B., Doctor of Technical Sciences  
TITLE: Development of the theory of foundry processes  
PERIODICAL: Vestnik Akademii nauk SSSR, no. 4, 1961, 134-135

TEXT: The coordinatsionnoye soveshchaniye po teorii liteynykh protsessev (Coordination Conference on the Theory of Foundry Processes) is described, which was held at the Institut mashinovedeniya Akademii nauk SSSR (Institute of the Science of Machines, Academy of Sciences USSR) from January 25 to 28, 1961 and dealt with problems of the interaction between mold and casting. The Conference was attended by collaborators of academic and scientific branch research institutes, schools of higher learning, plants, foundry experts, machine designers, experts of thermal physics, and physicochemists. Academician V. I. Dikushin opened the Conference and stated that it was its purpose to generalize the investigation results as well as to exchange experience in using various methods for regulating the hardening processes of castings by changing the parameters of the mold. The function of the mold consists of three types of interaction with the casting: thermal, force- and physico-  
Card 1/3

Development of...

S/030/61/000/004/015/015  
B105/B206

chemical types. The thermal efficiency of the mold was investigated which consists in absorbing the heat of the casting and warranting solidification and cooling of the metal at such a rate and sequence that the production of a casting of high quality is warranted. Problems of heat- and mass exchange in the wall of the sand mold were discussed. The second group of reports dealt with problems of mechanical interaction of the metal of the casting with the mold, inhibition of the shrinkage of the casting, development of pressures in the wall of the casting molds and mechanical cohesion of the surface crust with the molds. In reports dealing with the physicochemical interaction of mold and casting, processes of the formation of the casting surface and the formation of various surface defects, especially the pickup, were investigated. The Conference adopted recommendations for increasing the technological-economical indices of foundry production and improving the quality of the castings. The most promising trends for a further study of the problem of interaction of mold and casting were determined. The regular (eighth) Coordination Conference on the Theory of Foundry Processes envisaged for 1962 is to deal with the mechanical properties of the casting metal. Principles of selecting alloys with given mechanical and casting properties are to be discussed as well as the effect of technological factors on the mechanical properties


Card 2/3

Development of ...

S/030/61/000/004/015/015  
B105/B206

of the castings. Moreover, results of investigation and standardization of mechanical properties of castings from cast iron, steel and nonferrous metals are to be discussed as well as methods for increasing the mechanical properties of casting metals.

Card 3/3



5/13/61/006/007/001/017  
A054/A129

AUTHORS: Bakumenko, S. P., Vysotin, S. G., Engineers, Vardolovtsev, E. V.,  
Candidate of Technical Sciences, Vistunov, A. N., Engineer, Gulyayev,  
B. B., Doctor of Technical Sciences

TITLE: Heating ingot heads by exothermic mixtures

PERIODICAL: Stal', no. 7, 1961, 590 - 598

TEXT: In the Izhevskiy metallurgicheskiy zavod (Izhevsk Metallurgical Plant) tests were carried out to determine the optimum composition of exothermic mixtures used for heating ingot heads; to establish the shape of the ingot head and the method of feeding the mixtures. Two major types of mixtures were studied: conventional types used elsewhere and those developed in the IMZ. The latter were tested in three variants: a) containing 75% ferrosilicon, sodium-saltpeter + sand or saltpeter + calcined lime, manganese ore + lime; b) containing aluminum with saltpeter and lime, cinder + sand, iron ore + lime; c) containing calcium silicate with cinder + lime, iron ore + lime. The tests show that saltpeter has the highest oxidizing effect, disintegrating aluminum at 1600°C and oxidizing aluminum, calcium-silicate and even silicon. As to inflammability, the 75% ferrosilicon mix-

Card 1/7

Heating ingot heads by exothermic mixtures

1/132/01/000/007/001/017  
AC54/A129

tures containing saltpeter are, therefore, better than those made with ferrooxides (smoking mixtures). Mixtures consisting of ferro-oxides and aluminum have a high exothermic effect, but only when the aluminum content is between 10 - 20 %, while the high ferro-oxide content results in the formation of white spots. A suitable composition can be obtained with calcium silicate, displaying a high inflammability both with ferro-oxides and saltpeter, thus they can be made "non-smoking", while the high calcium silicate content maintains the reducing atmosphere which in turn prevents the formation of white spots. In order to establish the optimum method of feeding the mix into the ingot head, it was partly introduced in one layer (as done in the zavod Serp i Molot = Sickie and Kurnov Plant) and in two layers (as in the Vitkovitskiy plants; Abstracter's note: Czechoslovakia), using the mixtures of these two plants (70#20C = 70F20S and 35#15CK20C = 35F15SK20S). A better macrostructure was obtained by applying the mix in two layers. In the subsequent tests only this method was used therefore. Enlarging the ingot head to 18% when using exothermic heating increases the number of sub-skin defects. The head should therefore not be more than 13%. In order to define the optimum shape of the ingot head, four inserts were tested: a double-conical one with a volume of 12.5% ("A", on a 700 kg ingot) and three square inserts ("B", "C", "D", on 3.5 ton

Card 2/7

Heating ingot heads by exothermic mixtures

8/133/61/000/007/001/017  
A054/A129

ingots) with volumes of 13%, 13.4%, and 13.5%, having a conicity of 10.5, 18.5 and 24%, respectively. The optimum chemical homogeneity in the metal was obtained with the square insert having 10.5% conicity. In order to select the optimum heat-insulating substance, ash-drift, cupola-furnace ash, graphite, lime and mica flakes were tested. Their analysis (table 4) shows that the effect of the heat-insulating material depends, besides its actual insulating capacity, also on the ingot weight. In large ingots the best effect was obtained with ash, graphite and cupola-furnace ash, (i.e. substances with a low heat conductivity and low density). The smaller the ingot-weight, the less important is the insulating substance, because the solidification period of the ingot is nearly as long as the heat-insulating substance remains active. In spite of this, insulating materials should also be used in these ingots, because they improve the effect of the exothermic mixture. The chemical effect of heat-insulating substances was determined by the distribution of C, P, S and Si in templates and in the ladle. These tests were made with graphite (C: 89%), ash (C: 45%) and sand. The highest C and Si-liquation was found for ingots in which sand was used. When the mix is applied in a double-layer, at least 1.5 - 2.0 kg/t exothermic mix should be used for 3.0 - 3.5 t ingots and 1.0 - 1.5 kg/t for 0.7 t ingots, while ash should be used in an amount of 1.0 - 1.5 kg/t. The effect of the 11 selected exothermic mixtures was measured by the

Card 3/7

Heating ingot heads by exothermic mixtures

S/133/61/000/007/001/017  
A054/A129

duration of their burning and their pyrometric properties (Table 7). According to these parameters exothermic mixes can be divided into 4 groups: 1)  $\Lambda 14$  ( $L14$ ) and  $\Lambda 28V$  ( $L28V$ ) types, containing crushed charcoal and coke duff. They do not display visible pyrometric effect, and have a fairly high heat-insulating capacity. 2)  $15CK15C$  ( $15SK15S$ ) burns brightly and quickly but is not more efficient than type 1) mainly because it is employed in combination with ash. 3)  $15A15C_2$  ( $15A15S_2$ ) and  $15A15S_3$  are the least efficient, while 4)  $15A15S_1$ ,  $70F20S$  and  $50CK500$  ( $50SK500$ ) are between group 1) and 2); they display low and medium reaction rates and ensure a dense macrostructure with a cropping of 10 - 11%. The higher the pyrometric effect of the mix and the shorter time it is burning, the weaker is the heating of the ingot head. Therefore, in order to make the exothermic mix more effective, either delaying agents should be used to extend the burning time of the mix or secondary exothermic effects should be developed (when using, for instance,  $50SK500$ ,  $70F20S$ ). When these mixes with a higher Si-content are applied, the first phase of heating (during which the mixture is burning) is followed by the second phase of heating, during which silicon is diffused in the metal pores and the exothermic process takes place on account of silicon diffusion in the metal. Of the 11 test mixes the best results were obtained with  $15A15S_1$ ,  $50SK500$  and  $70F20S$ . They en-

Card 4/7

Heating ingot heads by exothermic mixtures

S/133/61/000/007/001/017  
AO54/A129

asured the highest degree of homogeneity and the densest macrostructure. When these mixes were used in combination with ash as heat-insulating agent, the head crop could be reduced to 10 - 12%. The use of the above-mentioned mixes and the 35F15SK208 type prevent the formation of white spots. With regard to hygienic conditions mixtures containing saltpeter can be used if special protective measures are taken. The 15A15S<sub>1</sub> mix requires adequate ventilation. The optimum mixture was found to be the 50SK500 type, being the cheapest (10.5 kp./kg), containing the minimum of components and being "non-smoking". When using for large ingots, its composition can still be improved when replacing 5 - 15% of the calcium silicate by 75% ferrosilicon. The tests were carried out with the participation of Ye. P. Gu-shin, V. I. Sarafanov, N. Ye. Vasil'yev, D. P. Oparin, Ye. G. Saprykin, A. I. Savintsev, M. N. Zhuravlev. There are 4 figures, 7 tables and 8 Soviet references.

ASSOCIATION: Izhevskiy metallurgicheskiy zavod (Izhevsk Metallurgical Plant)

Card 5/7

11500

27931s/133/61/000/009/008/011  
A054/A127

AUTHORS: Guglin, N. N., Gulyayev, B. B.

TITLE: Investigating the factors determining the formation of hot cracks in steel ingots and castings

PERIODICAL: Stal', no. 9, 1961, 830 - 836

TEXT: The continuous casting process is often handicapped by the formation of hot cracks in the ingot. Their formation is closely related to the strength and the ductility of the metal at temperatures near the freezing range and also to the degree of shrinkage that takes place in the ingot. Tests were carried out to study these characteristics, their dependence on the carbon, sulfur and phosphorus content of the metal, the pouring temperature and the reduction process. The strength and the ductility of the steel at temperatures approaching the freezing range and the shrinkage of the specimens were investigated on an installation designed especially for this purpose which is described by the authors. It was found, with regard to the carbon content of the metal, that a pronounced tendency to the formation of external, longitudinal cracks is characteristic of steels containing 0.16 - 0.18% carbon and having a low ductility. The tests referring

Card 1/4

X

27931

S/133/61/000/009/008/011  
A054/A127

Investigating the factors determining the...

to the dependence of the metal on temperature (with various carbon-content) showed that in the 1,450 - 1,320°C temperature range the 35Л (35L) grade steel possesses the greatest strength, whereas the least strength was found in chrome-nickel-copper steel alloys. The grades tested had the following strength limits at the highest (1,450°C) temperature (at which cracking of the solidifying skin is most likely to take place):

35Л (35L)	30ХНМ (30KhNM)	28ЛГЧН (28KhGSN)	30ХНД (30KhND)	40ХС (40Khs)	Г13 (G13)
8	6	4	3	2	1

(kg/cm<sup>2</sup>)

When the test temperature was lowered to 1,350°C the strength of the steels increased insignificantly; when the temperature dropped further, (below 1,350°C), the increase in strength became more pronounced. 1,350°C is therefore a critical temperature for the formation of hot cracks showing a characteristic intercrystalline fracture surface. An intercrystalline film which forms at this temperature determines the formation of fissures. Below 1,350°C this liquid film disappears and this results in a sudden increase in strength. The different degrees of strength in steels containing various alloying elements depends obviously on the effects of these elements and on the behavior and composition of this inter-

Card 2/4

27931 S/133/61/000/009/008/011  
A054/A127

Investigating the factors determining the...

crystalline film. The tests showed that in the critical 1,450 - 1,350°C range, alloyed steels have a lower ductility than carbon steels. This explains the tendency of most alloyed steels to crack formation, while, in addition, they are lower in strength. The interrelation between strength characteristics and relative elongation of alloy steels (G13, 40KhS, 28KhGSN) is also less favorable than that of 35L steel. To study the effect of the carbon content on shrinkage and extension tests were carried out with ferro-carbon alloys on an armco iron base to which pig iron or graphite was added. Maximum shrinkage was found in alloys with a carbon content between 0.18 and 1%, whereas in alloys with a carbon content of 1.3 - 5.0% elongations between 0 - 0.3% were observed. Investigating steels with the same carbon content for shrinkage, it was found that minimum free shrinkage takes place in 35L steel. In the critical temperature range shrinkage in carbon steels is generally about half that of chrome-nickel-molybdenum alloys and this is also one of the causes of hot cracking in these alloys. In fact, the greater the number of alloying elements, the greater the tendency to cracking. The effect of the phosphorus and sulfur content on the strength of 35L steel was also investigated. The strength of this steel decreases suddenly (from 15 to 7.5 kg/cm<sup>2</sup>) when the sulfur content exceeded 0.025%. The effect of the pouring temperature on the strength of 35L steel was tested at 1,510, 1,540 and 1,570°C with overheating over the liq-

Card 3/4

27931

S/133/61/000/009/008/011

A054/A127

Investigating the factors determining the...

uidus line by 30, 60 and 90° respectively. The increase in metal temperature during pouring results in a strength reduction. The authors investigated the effect of reducing methods and of adding rare-earth elements to the metal on its strength characteristics when the freezing point is almost attained on chrome-nickel-molybdenum steel with a 0.30% carbon content, while the kind and amount of additives varied. The following reducing processes were studied:

Variants:	II	III	IV	V	VI	VII
Calcium silicon (the % value according to Ca)	0.10	0.05	0.05	0.04	-	0.10
Aluminum	-	0.02	0.02	0.04	0.07	0.07
Ferrocium	0.2	-	0.3	-	-	0.3

The best results were obtained with variants IV and VII, which ensure the optimum combination of strength and ductility of the metal in the critical temperature range of crack formation. Thus, when chrome-nickel-molybdenum steel is reduced by aluminum alone, usually cracks appear in the ingot. When, however, reduction takes place according to the optimum variants, no cracks are formed. There are 13 figures and 6 references: 5 Soviet-bloc, 1 non-Soviet-bloc in Russian translation.

Card 4/4

GULYAYEV, B.B.; SHAPRANOV, I.A.; KOVALENKO, P.Ye.

Standards for steel castings. Lit. proizv. no.12:35-37 D '61.  
(MIRA 14:12)

(Steel castings--Standards)

GULYAYEV, B.B., doktor tekhn.nauk

Development of the theory of founding processes. Vest. AN  
SSSR 31 no.4:134-135 Ap '61. (MIRA 14:4)  
(Founding)

GULYAYEV, B.B.; ALEKSEYEV, P.Ye.; KONONOV, D.R.; STEPANOV, N.M.;  
Prinimali uchastiye: SHAPRANOV, I.A.; GARKUSHA, P.I.; KOVALENKO,  
P.Ye.; SHUVALOVA, N.A.; SMIRNOVA, N.I.

High strength foundry steel with good weldability. Lit.proizv.  
no.2:1-4 G '62. (MIRA 15:2)  
(Steel castings--Welding)

S/840/62/000/000/001/003  
EO21/E435

AUTHORS: Demidova, A.A., Gulyayev, B.B.

TITLE: The interaction of high-melting point metals with the  
mould material at high temperatures

SOURCE: Vzaimodeystviye liteynoy formy i otlivki.  
Inst. mashinoved. AN SSSR. Ed. by B.B.Gulyayev.  
Moscow, Izd-vo AN SSSR, 1962, 243-252

TEXT: Experimental moulds were prepared from various  
refractories. Rods were prepared from chromium, an iron-  
65% chromium alloy, titanium, niobium, molybdenum and tungsten.  
The rods were brought into contact with the moulds and melted,  
remaining in the molten state for 3 minutes. The samples were  
then examined visually and metallographically. The thickness of  
the contact zone was found and the structure of the zone was  
studied by petrographic analysis. The thicknesses (in mm)  
of the contact zones are shown in Table 2. It was shown that in  
general the contact zone consisted of three layers: (1) a mineral  
of a new form, (2) a layer of modified grains of the basic mould  
material and individual nuclei of the new formation and  
Card 1/3

S/840/62/000/000/001/003  
E021/E435

The interaction of high-melting ...

(3) a layer of the basic material little changed. The chemical stability of the refractory materials increased in the following order when casting titanium: zircon,  $\text{Al}_2\text{O}_3$ ,  $\text{MgO}$ ,  $\text{ZrO}_2$ ,  $\text{ZrC}$ ,  $\text{TiC}$ ,  $\text{TiB}_2$ . For casting chromium the order was  $\text{ZrO}_2$ ,  $\text{SiC}$ , spinel,  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{BeO}$ ,  $\text{ZrC}$ ,  $\text{TiC}$ ,  $\text{TiB}_2$ . For niobium the order was  $\text{ZrO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{ZrC}$ . Chamotte can be used for moulds when casting ferrochrome. Fine grained refractory material should be used for casting high melting point metals. There are 5 figures and 7 tables.

Table 2

Mould material	Fe-65Cr	Cr	Ti	Nb	Mo	W
Commercial $\text{Al}_2\text{O}_3$	4.8	-	-	-	-	-
Corundum	1.55	1.50	6.6	4.8	6.5	-
Chamotte	2.0	8.4	-	-	9.5	-
Fused $\text{ZrO}_2$	5.3	7.8	6.4	8.5	9.3	12.0
$\text{ZrO}_2 \cdot \text{SiO}_2$	-	-	7.5	11.8	-	-
Fused $\text{MgO}$	3.4	5.4	7.3	-	-	12.0
$\text{MgO}$ bricks	-	4.3	6.3	-	-	-
Card 2/3						

The interaction of high-melting ...

S/840/62/000/000/001/003  
E021/E435

Table 2 (continued)

Mould material	Fe-65Cr	Cr	Ti	Nb	Mo	W
Pure MgO	-	5.0	-	-	-	-
Cr <sub>2</sub> O <sub>3</sub>	5.4	-	-	-	-	-
TiO <sub>2</sub>	-	12.0	12.0	12.0	-	-
CeO <sub>2</sub>	-	11.2	11.8	-	-	-
BeO	-	1.9	-	-	-	-
Spinel, CaO·CrO <sub>3</sub>	-	6.48	-	-	-	-
MgOCr <sub>2</sub> O <sub>3</sub>	-	6.72	-	-	-	-
Chrome-magnesite	-	-	5.5	-	-	-
SiC	1.55	7.2	9.5	-	-	-
TiC	-	<1	<1	-	-	-
ZrC	-	<1	<1	1.5	-	-
TiBr	-	<1	<1	-	-	-
Powdered quartz	10.0	-	12.0	12.0	-	-
Fused quartz	4.5	-	-	-	-	-

Card 3/3

GULYAYEV, B.B., prof., doktor tekhn. nauk, otv. red.; RZHEVSKIY, V.F.,  
red. izd-va; LAUT, V.G., tekhn. red.; BALLAD, A.I., tekhn.red.

[Interaction of molds and castings]Vzaimodeistvie liteinoy  
formy i otlivki. Moskva, Izd-vo Akad. nauk SSSR, 1962. 334 p.  
(MIRA 15:9)

1. Akademiya nauk SSSR. Institut mashinovedeniya.  
(Founding)

ALFEROVA, N.S., doktor tekhn. nauk; BERNISHTEYN, M.L., kand. tekhn. nauk; BLANIER, M.Ye., doktor tekhn. nauk; BOKSHTEYN, S.Z., doktor tekhn.nauk; VINOGRAD, M.I., kand. tekhn.nauk; GAMOV, M.I., inzh.; GELLER, Yu.A., doktor tekhn. nauk; GOTLIB, L.I., kand. tekhn. nauk; GEDINA, Yu.V., doktor tekhn.nauk; GRIGOROVICH, V.K., kand. tekhn. nauk; GULYAYEV, B.B., doktor tekhn. nauk; DOVGAEVSKIY, Ya.M., kand. tekhn. nauk; DUDOVITSEV, P.A., kand. tekhn. nauk [deceased]; KIDIN, I.N., doktor tekhn. nauk; LEYKIN, I.M., kand. tekhn. nauk; LIVSHITS, B.G., doktor tekhn. nauk; LIVSHITS, L.S., kand. tekhn. nauk; L'VOV, M.A., kand. tekhn. nauk; MEYERSON, G.A., doktor tekhn. nauk; MINKEVICH, A.N., kand. tekhn. nauk; NATANSON, A.K., kand. tekhn. nauk; NAKHIMOV, A.M., inzh.; NAKHIMOV, D.M., kand. tekhn. nauk; OSTRIN, G.Ya., inzh.; PANASENKO, F.L., inzh.; SOLODIKHIN, A.G., kand. tekhn.nauk; KHBUSHIN, F.F., kand. tekhn. nauk; CHERNASHKIN, V.G., kand. tekhn. nauk; YUDIN, A.A., kand. fiz.-mat. nauk; YANKOVSKIY, V.M., kand. tekhn. nauk; RAKHSHTADT, A.G., red.; GORDON, L.M., red. izd-va; VAYNSHTEYN, Ye.B., tekhn. red.

(Continued on next card)

ALFEROVA, N.S.--- (continued) Card 2.

[Metallography and the heat treatment of steel]Metallo-  
vedenie i termicheskaja obrabotka stali; spravochnik.  
Izd.2., perer. i dop. Pod red. M.L.Bernshteina i A.G.  
Rakhshtadta. Moskva, Metallurgizdat. Vol.2. 1962.  
1656 p.

(MIRA 15:10)

(Steel--Metallography)  
(Steel--Heat treatment)

OBOLENTSEV, Fedor Dmitriyevich; GULYAYEV, B.B., doktor tekhn. nauk,  
prof., retsenzent; SOKOLOV, A.N., kand. tekhn. nauk, dots., red.;  
VARKOVETSKAYA, A.I., red. izd-va; BARDINA, A.A., tekhn. red.

[Quality of cast surfaces] Kachestvo litykh poverkhnostei. Moskva,  
Mashgiz, 1961. 181 p. (MIRA 15:6)

(Founding--Quality control)

(Surfaces (Technology))

S/698/61/000/000/001/002  
D040/D112

AUTHORS: Gulyayev, B.B.; Demidova, A.A.

TITLE: Akademiya nauk SSSR. Institut mashinovedeniya. Komissiya po tekhnologii mashinostroyeniya. An investigation of the properties of molding materials for refractory metal castings

SOURCE: Soveshchaniye po teorii liteynykh protsessov. 6th, 1960. Teoriya formovki; trudy soveshchaniya. Moscow, Izd-vo AN SSSR, 1961, 46-51

TEXT: The authors describe an experimental investigation into the properties of different molding materials used for casting refractory metals, and of investment molds made of these materials; these properties have not yet been studied sufficiently. Mixes were prepared from molten zirconium dioxide, artificial corundum ( $Al_2O_3$ ), silicon carbide, fireclay, molten and pulverized quartz, and three different binders - K.P.(KS), hydrolyzed ethyl silicate, and waterglass treated with ammonium chloride ( $NH_4Cl$ ) by P.S.Pershin's method. [Abstracter's note: The chemical composition of the KS binder is not given and Pershin's method is not described.] Corundum, quartz sand, zirconium dioxide, fireclay (all of different mesh), and silicon carbide with a 0.2 mm grain size were used as dusting powders. The linear expansion, strength and permeability of the molds and the surface quality of the castings were studied. The data show that the best results were obtained with

Card 1/2

An investigation of the properties .....

S/698/61/000/000/001/002  
D040/D112

multi-coat molds in which the first coat was of  $Al_2O_3$  with KS for a binder, and the following coats were of  $Al_2O_3$  with waterglass treated with  $NH_4Cl$ . The mesh of the dusting powder had a great effect on the mold porosity in molds of powder quartz with ethyl silicate; when the grain size of the quartz was 0.2 mm, large grains pierced the thin first coat. However, the grain size of the dusting powder did not have such a great effect in coats of  $Al_2O_3$  with a KS binder. Coats of  $ZrO_2$  had the highest porosity, regardless of the binder used. The permeability was studied with a test instrument of the Usmanskii zavod (Usman' Plant). The data are summarized in tables and graphs. The test castings were made of chromium-base alloys. There are 7 tables and 2 figures.

Card 2/2

GUGLIN, N.N.; GULYAYEV, B.B.

Investigating factors determining the formation of hot  
cracks in steel ingots and castings. Stal' 21 no.9:830-836  
S '61. (MIRA 14:9)  
(Steel ingots--Defects) (Steel castings--Defects)

34058

3/128/62/000/022/001/007  
A004/A127

18.1100

AUTHORS: Gulyayev, B.B.; Alekseyev, P.Ye.; Kononov, D.R.; Stepanov, N.M.

TITLE: High-strength cast steel of good weldability

PERIODICAL: Liteynoye proizvodstvo, no. 2, 1962, 1 - 4

TEXT: The authors point out that the steel grades 30XHMJL(30KXNMJL), 30XHBJL(30KXNVL) and 30DXCHJL(30DKhSNL) with  $\sigma_s$  exceeding 50 kg/mm<sup>2</sup> according to GOST (GOST) 7832-55 have no good weldability and unsatisfactory casting properties, while the steel grades 10XHDTJL(10KXNDTL), 13XHDTJL(13KXNDFTL) and 08ГДНФЛ(08ГДНФЛ), though of good weldability, are no high-strength steels, with  $\sigma_s$  not exceeding 40 - 45 kg/mm<sup>2</sup> after heat treatment. Investigations were carried out with compositions containing the following alloying additives: 0.8 - 1.4 % Si, 1.2 - 1.4 % Mn, 0.8 - 1.5% Cr, 0.8 - 3.0% Ni, 0.2 - 0.3% Mo, 0.6 - 0.8% W, 0.1 - 0.2% V, 0.1 - 0.2% Ti, 0.5 - 2.5% Cu, 1.5 - 1.8% Al, 0.2 - 0.3% Co. The following scientific workers participated in the development, investigations and introduction of steel grades of good weldability: I.A. Shapranov, P.I. Garkushka, P.Ye. Kovalenko, N.A. Shuvalova and N.I. Smirnova. The authors describe various tests being carried out with specimens of different steels, e.g., 12CGFL

Card 1/2

34058

3/128/68/005/0006/00012-9  
A004/A17/

High-strength cast steel of good weldability

(12S3FL), 12CH2ΦЛ(12СН2ФЛ), 12X2HMЛ(12Xh2NMЛ), 12ДН2ΦЛ(12DN2FL), 12ДЧН2ΦЛ(12DSN2FL) and 12ДГΦЛ(12DGFL), of which the 12S3FL, 12SN2FL and 12DGFL grades had  $\sigma_s$  of less than 50 kg/mm<sup>2</sup>, while the remaining grades ensured  $\sigma_s = 50 - 60$  kg/mm<sup>2</sup> in 100 mm cross sections. Tests on a special device revealed that the mechanical properties of all experimental steel grades near the crystallization temperature were not inferior to the 35Л(35L) grade. The optimum combination of mechanical properties, weldability and technological properties was shown by the grades 12DGFL, 12DN2FL, 12DSN2FL and 12SN2FL, of which a test lot was smelted in a basic electric arc furnace with subsequent casting of components of intricate configuration. Technical data presented in a table show that grade 12DN2FL steel having a good weldability, possessed  $\sigma_s$  of not lower than 55 kg/mm<sup>2</sup> combined with a high ductility and notch toughness. The authors report on investigations being carried out to establish the most favorable heat treatment conditions for the above-mentioned steel grades, present a number of comparative graphs and tables, and in their conclusion especially recommend the 12DN2FL grade steel of good weldability and the high-strength 12DN2FL grade steel possessing an excellent weldability to be used extensively and to be included in the GOST standard. There are 6 figures and 4 tables.

Page 2/2

ACCESSION NR: AT4016063

S/2698/63/000/000/0147/0152

AUTHOR: Gulyayev, B. B.; Stepanov, S. A.; Alekseyev, P. Ye.; Sandomirskiy, M. M.

TITLE: An investigation of the properties of high-strength cast steel with good weldability

SOURCE: Soveshchaniye po teorii liteyny\*kh protsessov. 8th, 1962. Mekhanicheskiye svoystva litogo metalla (Mechanical properties of cast metal). Trudy\* soveshchaniya, Moscow, Izd-vo AN SSSR, 1963, 147-152

TOPIC TAGS: welding, steel welding, high strength steel, cast steel, cast steel welding, steel, alloy steel

ABSTRACT: Engineers in various fields are making wide use of cast-welded structures, the parts of which consist of stamped details, rolled stock, and steel castings. The welding properties of cast steel, however, depend markedly on the composition. The authors therefore developed a new grade 12DKhNGDL steel which welds easily and may be used for complex castings. First of all, only 0.1-0.2% carbon was used in the steel, plus the following combined admixtures: chromium and nickel; chromium, nickel and molybdenum; or chromium, manganese and silicon, as well as vanadium and copper.

1/3

Card

ACCESSION NR: AT4016063

From among an initial group of 35 experimental melts, the best mechanical properties were obtained with 15KhGSMF, 15KhGSNMF, 15SGNMF, 15KhN3MF, 15KhN3VF, 15Kh2NMF, 10DGN2F, 100KhNMF, 15DSGNV and 15DKhGN2MF. Further studies on their mechanical, casting and welding properties were then performed with these steels. Table 1 of the Enclosure shows the chemical composition of the five best steels with respect to crack resistance and general strength. On the basis of further tests on a commercial scale (5-ton electric arc furnace), grade 15DGN2FL steel is recommended for thin-walled castings working at normal and low temperatures, while grade 12DKhN1-MFL steel is recommended for thick-walled castings working at normal temperatures. Orig. art. has: 2 figures and 3 tables.

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 27Dec63

ENCL: 01

SUB CODE: MM

NO REF SOV: 000

OTHER: 000

2/3

Card

ACCESSION NR: AT4016063

ENCLOSURE: 01

TABLE 1

GRADE	C	Si	Mn	Cr	Ni	Mo	V	Cu
15KhN2MF	$\frac{0,12}{0,18}$	$\frac{0,2}{0,4}$	$\frac{0,5}{0,8}$	$\frac{1,2}{1,4}$	$\frac{1,6}{2,0}$	$\frac{0,20}{0,30}$	$\frac{0,10}{0,20}$	< 0,3
15Kh2NMF	$\frac{0,12}{0,18}$	$\frac{0,2}{0,4}$	$\frac{0,4}{0,7}$	$\frac{1,8}{2,4}$	$\frac{1,2}{1,5}$	$\frac{0,20}{0,30}$	$\frac{0,10}{0,20}$	< 0,3
15DGN2F	$\frac{0,12}{0,18}$	$\frac{0,2}{0,4}$	$\frac{1,2}{1,4}$	< 0,4	$\frac{1,8}{2,2}$	—	$\frac{0,10}{0,20}$	$\frac{1,2}{1,5}$
15DKhGN2MF	$\frac{0,12}{0,18}$	$\frac{0,2}{0,4}$	$\frac{0,9}{1,2}$	$\frac{0,8}{1,2}$	$\frac{1,8}{2,2}$	$\frac{0,20}{0,30}$	$\frac{0,10}{0,20}$	$\frac{1,2}{1,5}$
12DKhNMF	$\frac{0,10}{0,15}$	$\frac{0,20}{0,45}$	$\frac{0,30}{0,55}$	$\frac{1,20}{1,70}$	$\frac{1,4}{1,8}$	$\frac{0,20}{0,30}$	$\frac{0,08}{0,15}$	$\frac{0,40}{0,65}$

Card 3/3

ACCESSION NR: AT4016071

S/2698/63/000/000/0259/0264

AUTHOR: Perminov, V. P.; Gulyayev, B. B.

TITLE: Influence of various alloying elements on the mechanical properties of aluminum alloy castings

SOURCE: Soveshchaniye po teorii lityny\*kh protsessov. 8th, 1962. Mekhanicheskiye svoystva litogo metalla (Mechanical properties of cast metal). Trudy\* soveshchaniya. Moscow, Izd-vo AN SSSR, 1963, 259-264

TOPIC TAGS: aluminum alloy, aluminum casting, alloying element, magnesium, iron, cast aluminum, magnalium, aluminum silicon alloy

ABSTRACT: The author reports the results of tests on the effect of alloying elements on the ultimate strength, yield point, hardness, and relative elongation of aluminum alloys (Al + 5%Si and Al + 5% Mg). Analysis of the plotted curves shows that the effectiveness of the added element is related to its atomic number in a periodic way. Most of the alloying elements increased the yield point and decreased the relative elongation (see Figure 1 of the Enclosure), pure aluminum being affected more than its alloys, especially magnalium. Since a similar periodicity is seen in the solubility of these additives in solid Al, the authors conclude that the greatest effect on mechanical

1/4

Card

58"  
ACCESSION NR: AT4016071

properties will be produced by admixtures introducing the most asymmetry into the outer electron shells of the basic element. Hence, neither the inert gases nor elements in the same group of the periodic table as the basic element will have very much effect. Further studies showed that the effect of Si on the mechanical properties of Al-Si alloys does not depend on the type of heat treatment or presence of additives. Furthermore, the ultimate strength, yield point, hardness, and relative elongation in Al-Si-Mg and Al-Si-Fe alloys are essentially independent of the quantity of silicon in the alloy (within the limits of 5-12% Si). Orig. art. has: 3 formulas and 4 figures.

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 27Dec63

ENCL: 02

SUB CODE: MM

NO REF SOV: 007

OTHER: 000

2/4

Card

ACCESSION NR: AT4016071

ENCLOSURE:01

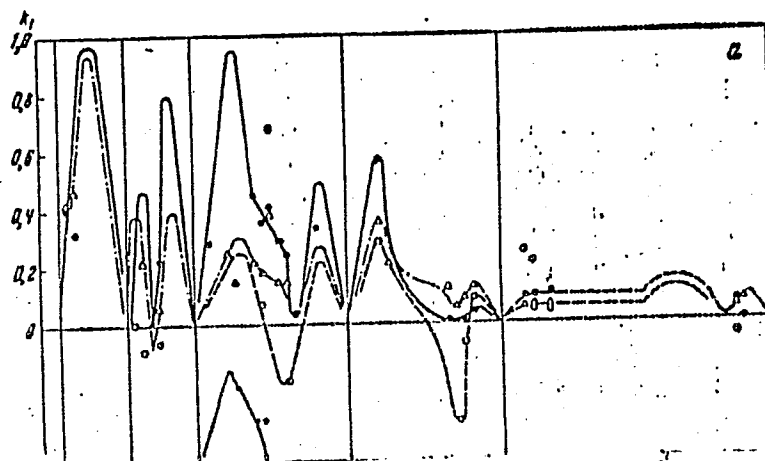


Fig. 1 - Effect of coefficients of the ultimate strength a and the elongation b.  
1 - A00; 2 - A00 + 5% Si; 3 - A00 + 5% Mg

Card 3/4

ACCESSION NR: AT4016071

ENCLOSURE:02

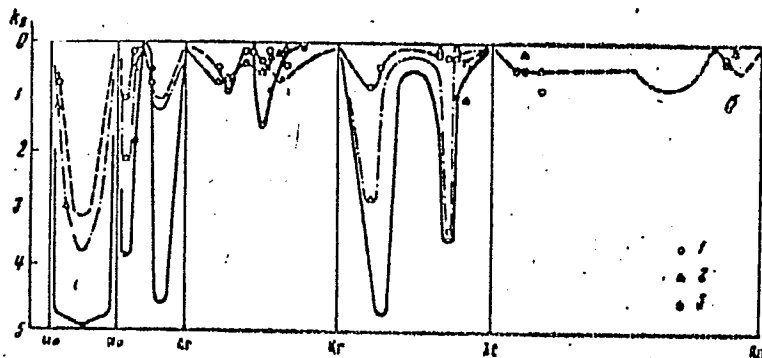


Fig. 1 (Continued) - Effect of coefficients of the ultimate strength a and the elongation b.

1 - A00; 2 - A00 + 5% Si; 3 - A00 + 5% Mg

Card

4/4

GULYAYEV, B.B., doktor tekhn. nauk, prof., otv. red.; GET'MAN, A.A.,  
kand. tekhn. nauk, red.; ORPIK, S.L., red. izd-va

[Mechanical properties of cast metals] Mekhanicheskie svoitva  
litogo metalla; trudy. Moskva, Izd-vo AN SSSR, 1963. 307 p.  
(MIRA 16:12)

1. Soveshchaniye po teorii liteynykh protsessov. 8th.  
(Metal castings—Testing)

ACCESSION NR: AT4016065

S/2698/63/000/000/0217/0222

AUTHOR: Demidova, A. A.; Gulyayev, B. B.

TITLE: Effect of the casting mold on the mechanical properties of refractory metals

SOURCE: Soveshchaniye po teorii liteynykh protsessov. 8th, 1962. Mekhanicheskiye svoystva litogo metalla (Mechanical properties of cast metal). Trudy\* soveshchaniya. Moscow, Izd-vo AN SSSR, 1963, 217-222

TOPIC TAGS: refractory metal, titanium alloy, chromium alloy, casting, cast metal mechanical property, casting mold, casting mold material

ABSTRACT: The authors studied the effect of the casting mold material on the deterioration of cast alloys containing titanium and chromium. Casting was performed in a special laboratory unit in test molds. The test mold material ( $\text{SiO}_2$ ,  $\text{TiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{ZrSiO}_4$ ,  $\text{MgO}$ ,  $\text{ZrSiO}_4$  or graphite) significantly influenced the gas content ( $\text{H}_2$ ,  $\text{N}_2$  and  $\text{O}_2$ ) of the titanium and chromium alloys and this, in turn, determined the mechanical properties of the cast metal. Orig. art. has: 5 figures and 3 tables.

ASSOCIATION: none  
Card 1/1

ACCESSION NR: AT4016066

s/2698/63/000/000/0223/0228

AUTHOR: Kukkonen, E. Ya.; Kaplunovskiy, G. A.; Magnitskiy, O. N.; Gulyayev, B. B.

TITLE: Effect of the characteristics of the technological process on the properties of heat-resistant metal castings

SOURCE: Soveshchaniye po teorii liteynykh protsessov. 8th, 1962. Mekhanicheskiye svoystva litogo metalla (Mechanical properties of cast metal). Trudy soveshchaniya. Moscow, izd-vo AN SSSR, 1963, 223-228

TOPIC TAGS: refractory metal, heat resistant alloy, alloy casting, molybdenum alloy, tungsten alloy, carbon containing alloy, titanium alloy, cast metal property

ABSTRACT: The lack of industrial flow processes for manufacturing heat-resistant metals has led to insufficient knowledge of the properties of these castings. The authors investigated the influence of the methods of melting, casting parameters and other features on the properties of alloy castings containing titanium and molybdenum. The metals were cast in a DVP-15 vacuum electric oven with an electric arc in a carbon crucible. Parts are currently made of molybdenum by plastic bending of castings obtained by electric arc fusion of special packs of molybdenum and crystallization in water-cooled copper molds. Melting of molybdenum with a tungsten electrode and casting in centrifugal copper molds ensures the highest quality of dense molybdenum castings with fine structure. Orig. art has: 6 figures and 3 tables.

GULYAYEV, B.B., doktor tekhn. nauk, prof., otv. red.; GET'MAN,  
A.A., kand. tekhn. nauk, red.; BOROVILY, Yu.F., kand.  
tekhn. nauk, red.; SOLOVYEV, Yu.I., kand. tekhn. nauk,  
red.; KUZIN, A.V., inzh., red.

[Gases in cast metal] Gazy v litom metalle. Moskva, Izd-vo  
"Nauka," 1964. 262 p. (MIRA 17:6)

1. Moscow. Institut mashinovedeniya.

GULYAYEV, B.B.; MAGNITSKIY, O.N.; DEMILOVA, A.A.; Prinipali  
uchastiye: KAPLUNOVSKIY, G.A.; KUKKONEN, E.Ya.; BUTALOV,  
L.V., kand. tekhn. nauk, retsenzent

[Castings of high-melting metals] Lit'e iz magoplavkikh me-  
tallov. Moskva, Izd-vo "Mashinostroenie," 1964. 291 p.  
(MIRA 17:5)